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## MEMORANDUM

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TO: Michael Berkoff, USEPA

REF. NO.: 056393-08

FROM: Greg Carli/Leah Pabst/bjw/adh/12

DATE: January 31, 2012

C.C.: 12th Street Landfill Technical Team:

Richard Gay, Weyerhaeuser; Kristi Zakrzewski, MDEQ;  
John Bradley, MDEQ; Jeff Keiser, CH2MHill;  
Scott Hutsell, CH2MHill

US EPA RECORDS CENTER REGION 5



464721

RE: October 2011 Quarterly Groundwater Sampling Results  
12th Street Landfill-Operable Unit No. 4-Allied Paper/Portage Creek/Kalamazoo River  
Superfund Site, Otsego Township, Michigan

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This memorandum has been prepared by Conestoga-Rovers & Associates (CRA) to summarize the results of the October 2011 quarterly groundwater sampling event, performed at the 12<sup>th</sup> Street Landfill, Operable Unit No. 4 - Allied Paper/Portage Creek/Kalamazoo River Superfund Site, located in Otsego Township, Michigan between October 25, 2011 and October 27, 2011.

The October 2011 sampling event was the first quarterly sampling event performed as part of the Operation, Maintenance, and Monitoring (OMM) activities at the Site. The most recent sampling event prior to this was the post-installation event performed in April 2011 following the installation of the groundwater monitoring well network.

A total of 15 groundwater monitoring wells (MW-101S, MW-101D, MW-102S, MW-102D, MW-103D, MW-104S, MW-104D, MW-105S, MW-105D, MW-106S, MW-106D, MW-107S, MW-108S, MW-108D, and MW-109D) were installed in February 2011, at varying depths, around the perimeter of the landfill to complete the OMM monitoring well network. The locations of the monitoring wells are shown on Figure 1. Prior to the October 2011 sampling event, CRA collected static water levels for 2 weeks from each well and the River staff gauge, as required in the Performance Standards Verification Plan (PSVP); Appendix D of the OMM Plan (May 2011). Figure 2 presents the shallow groundwater elevation contours, and Figure 3 presents the deep groundwater elevation contours, both from the pre-sampling water level event in October 2011. Monitoring well construction details and groundwater elevations from the water level collection event are presented in Table 1.

CRA collected the October 2011 groundwater samples from the monitoring well network. Field measurements of pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), conductivity (mS/cm), temperature (Deg C), and turbidity (NTU) were collected. Samples were collected using low flow sampling and submitted for laboratory analysis of target compound list (TCL) volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and metals consisting of magnesium, mercury, and sodium. The October 2011 analytical results were compared to Michigan Act 451, Part 201 Cleanup Criteria and Part 213

Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria, identified by Michigan Department of Environmental Quality (MDEQ) Remediation and Redevelopment Division (RRD) Op Memo No. 1, updated March 25, 2011, pursuant to 1994 PA 451 as amended. The October 2011 analytical results and field parameters are presented in Table 2.

The analytical results of the April 2011 sampling event yielded various metals exceeding the Part 201 Cleanup Criteria and Part 213 Risk-Based Criteria. The majority of these exceedances are for residential and non-residential drinking water criteria; however, groundwater surface water interface (GSI) criteria exceedances were also observed. The October 2011 analytical results also showed various residential and non-residential exceedances, with some metals exceeding GSI criteria. The analytical results for metals exceeding GSI criteria for the April 2011 and October 2011 sampling events are shown on Figure 4. Figure 4 also includes total PCB detections from both the April 2011 and October 2011 sampling events.

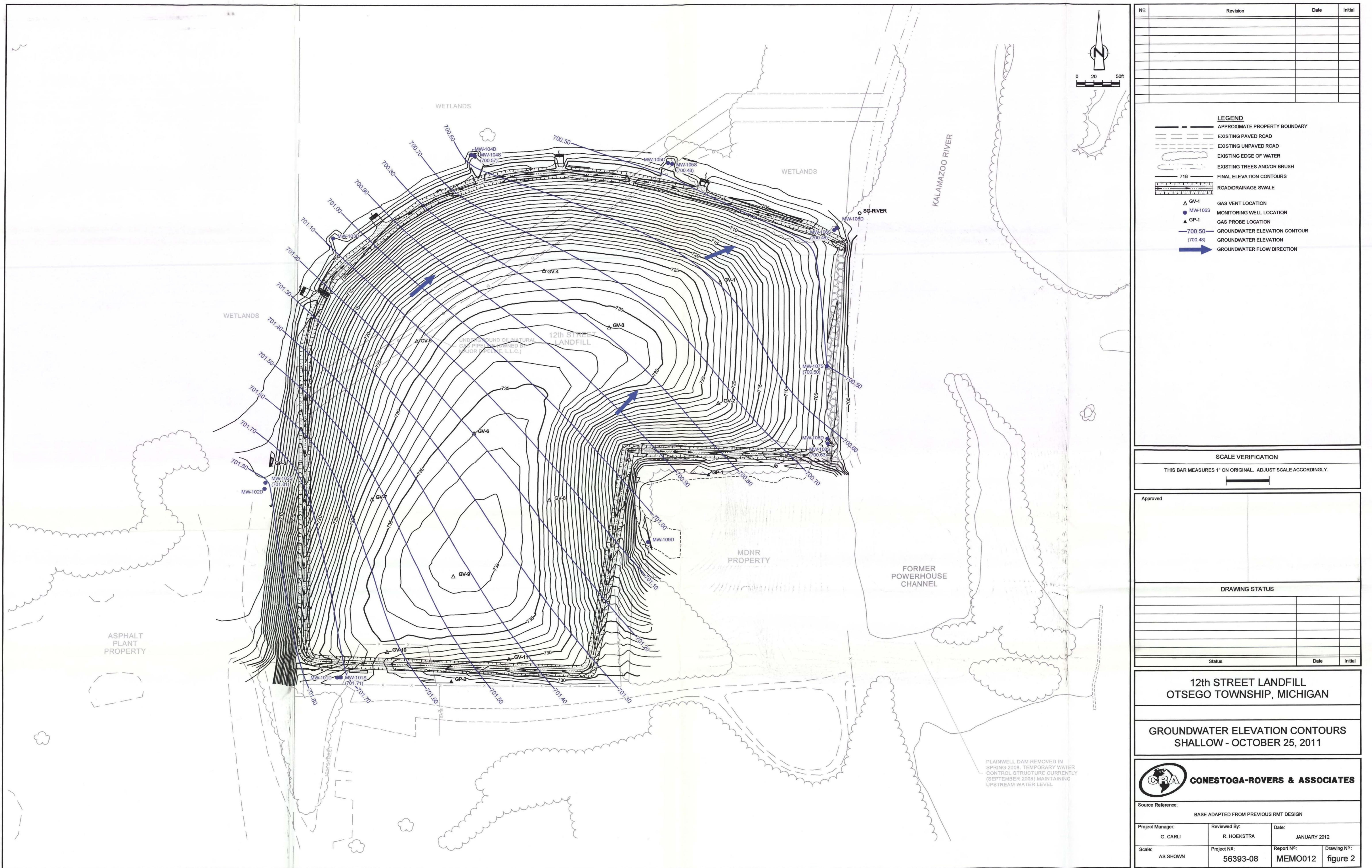
The following summarizes the October 2011 analytical results:

- VOC parameters were either non-detect or detected at low concentrations below the applicable criteria.
- Magnesium, mercury, and sodium were consistently detected in the October 2011 samples. All but one of the detections were below the Part 201 and Part 213 criteria; mercury was detected at a level of 0.0203 micrograms per liter ( $\mu\text{g}/\text{L}$ ) at MW-106S, exceeding the GSI criterion of 0.0013  $\mu\text{g}/\text{L}$ . Mercury was previously detected in the April 2011 analytical results at concentrations above the GSI; it should be noted that low level mercury sampling methods were used for the October 2011 sampling event and were not utilized during the April 2011 events.
- PCBs were not detected at all but one location (i.e., MW-106D), where they were detected below the applicable criteria.
- Various cyanide detections were identified in the October 2011 sampling results. Of the detections, four exceedances of the GSI criteria were observed in both shallow and deep wells e.g., MW-102S, MW-102D, MW-103D, and MW-106S).

Quarterly and semiannual groundwater monitoring will continue at the Site as described in the OMM Plan, submitted to United States Environmental Protection Agency (USEPA) on May 9, 2011. The next sampling event is scheduled to occur in February 2012 and will consist of a semiannual event as outlined in the OMM Plan (e.g., TCL VOCs, semi-volatile organic compound [SVOCs], PCBs, total analyte list [TAL] metals, and polychlorinated dibenzodioxins/polychlorinated dibenzofurans [PCDD/PCDF]).

## FIGURES









## TABLES

TABLE 1

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**GROUNDWATER MONITORING WELLS**  
**OCTOBER 2011 WATER LEVEL DATA**  
**12th STREET LANDFILL**  
**OTSEGO, MICHIGAN**

<b>Locations</b>	<b>Ground Surface</b>	<b>Reference</b>	<b>Monitoring</b>	<b>Screened</b>	<b>October 2011 Water Level Data</b>						
	<b>Elevation</b> <i>(feet AMSL)</i>	<b>Elevation</b> <i>(feet AMSL)</i>	<b>Well Depth</b> <i>(feet bgs)</i>	<b>Interval</b> <i>(feet AMSL)</i>	<b>10-Oct-11</b>	<b>12-Oct-11</b>	<b>14-Oct-11</b>	<b>17-Oct-11</b>	<b>19-Oct-11</b>	<b>21-Oct-11</b>	<b>25-Oct-11</b>
MW-101S	734.35	737.46	39	702.35 to 695.35	36.46	36.53	36.38	36.14	36.45	35.83	35.75
MW-101D	734.33	737.14	75	664.33 to 659.33	36.15	36.22	36.08	36.45	36.12	35.49	35.38
MW-102S	704.18	707.36	10	701.18 to 694.18	6.29	6.35	6.18	6.28	6.24	5.63	5.55
MW-102D	704.43	707.43	45	664.43 to 659.43	6.33	6.40	6.21	6.32	6.28	5.67	5.60
MW-103D	704.37	707.36	35	674.37 to 669.37	7.03	7.11	6.82	6.99	6.88	6.31	6.28
MW-104S	703.86	706.55	25.5	684.86 to 677.86	6.80	6.86	6.53	6.73	6.60	6.00	5.98
MW-104D	703.48	706.42	45	663.48 to 658.48	6.62	6.69	6.38	6.56	6.44	5.83	5.80
MW-105S	704.89	707.86	12	699.89 to 692.89	8.34	8.40	8.02	8.26	8.10	7.40	7.38
MW-105D	704.78	707.89	47	662.78 to 657.78	8.15	8.21	7.90	8.08	8.00	7.22	7.18
MW-106S	703.88	706.96	9	701.88 to 694.88	7.52	7.61	7.22	7.44	7.36	6.44	6.48
MW-106D	703.66	706.36	45	664.66 to 659.66	6.79	6.86	6.54	6.70	6.64	5.78	5.76
MW-107S	703.76	706.73	13	695.76 to 690.76	7.09	7.16	6.83	6.70	6.92	6.04	6.23
MW-108S	703.32	706.21	9	701.32 to 694.32	6.43	6.49	6.15	6.34	6.24	5.40	5.58
MW-108D	703.39	706.16	45	663.39 to 658.39	6.43	6.50	6.18	6.34	6.28	5.41	5.61
MW-109D	707.41	710.46	23	689.41 to 684.41	9.99	10.04	9.82	9.94	9.91	9.50	9.21

Notes:

feet AMSL - Feet above sea level.

feet bgs - Feet below ground surface.

TABLE 1

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**GROUNDWATER MONITORING WELLS**  
**OCTOBER 2011 WATER LEVEL DATA**  
**12th STREET LANDFILL**  
**OTSEGO, MICHIGAN**

<i>Locations</i>	<i>Ground Surface Elevation</i>	<i>Reference Elevation</i>	<i>Monitoring Well Depth</i>	<i>Screened Interval</i>	<i>October 2011 Water Level Data</i>						
	(feet AMSL)	(feet AMSL)	(feet bgs)	(feet AMSL)	10-Oct-11	12-Oct-11	14-Oct-11	17-Oct-11	19-Oct-11	21-Oct-11	25-Oct-11
MW-101S	734.35	737.46	39	702.35 to 695.35	701.00	700.93	701.08	701.32	701.01	701.63	701.71
MW-101D	734.33	737.14	75	664.33 to 659.33	700.99	700.92	701.06	700.69	701.02	701.65	701.76
MW-102S	704.18	707.36	10	701.18 to 694.18	701.07	701.01	701.18	701.08	701.12	701.73	701.81
MW-102D	704.43	707.43	45	664.43 to 659.43	701.10	701.03	701.22	701.11	701.15	701.76	701.83
MW-103D	704.37	707.36	35	674.37 to 669.37	700.33	700.26	700.54	700.38	700.48	701.05	701.08
MW-104S	703.86	706.55	25.5	684.86 to 677.86	699.75	699.70	700.02	699.82	699.95	700.55	700.57
MW-104D	703.48	706.42	45	663.48 to 658.48	699.80	699.73	700.04	699.86	699.98	700.59	700.62
MW-105S	704.89	707.86	12	699.89 to 692.89	699.52	699.46	699.84	699.60	699.76	700.46	700.48
MW-105D	704.78	707.89	47	662.78 to 657.78	699.74	699.68	699.99	699.81	699.89	700.67	700.71
MW-106S	703.88	706.96	9	701.88 to 694.88	699.44	699.35	699.74	699.52	699.60	700.52	700.48
MW-106D	703.66	706.36	45	664.66 to 659.66	699.57	699.49	699.82	699.66	699.72	700.58	700.60
MW-107S	703.76	706.73	13	695.76 to 690.76	699.65	699.57	699.90	700.03	699.81	700.69	700.50
MW-108S	703.32	706.21	9	701.32 to 694.32	699.78	699.72	700.06	699.88	699.97	700.81	700.63
MW-108D	703.39	706.16	45	663.39 to 658.39	699.73	699.66	699.98	699.82	699.88	700.76	700.55
MW-109D	707.41	710.46	23	689.41 to 684.41	700.47	700.42	700.64	700.52	700.55	700.96	701.25

## Notes:

feet AMSL - Feet above sea level.

feet bgs - Feet below ground surface.

TABLE 2

**SUMMARY OF OCTOBER 2011 GROUNDWATER ANALYTICAL RESULTS**  
**12th STREET LANDFILL**  
**OTSEGO TOWNSHIP, MICHIGAN**

**Sample Location:**  
**Sample Identification:**  
**Sample Date:**  
**Sample Type:**

<b>MW-101S</b> WG-56393-102511-JV-019 10/25/2011	<b>MW-101D</b> WG-56393-102511-JV-018 10/25/2011	<b>MW-102S</b> WG-56393-102511-JV-020 10/25/2011	<b>MW-102S</b> WG-56393-102511-JV-021 10/25/2011
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	<b>Units</b>	<b>Groundwater Cleanup Criteria <sup>(a)</sup></b>			<b>Duplicate</b>		
		<b>a</b>	<b>b</b>	<b>c</b>			
<b>Volatile Organic Compounds</b>							
Acetone	µg/L	730	2100	1700	R	R	R
Benzene	µg/L	5	5	200	0.50 U	0.50 U	0.50 U
Bromodichloromethane	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U
Bromoform	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	µg/L	10	29	35	0.50 U	0.50 U	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	13000	38000	2200	R	R	R
Carbon disulfide	µg/L	800	2300	ID	0.50 U	0.50 U	0.50 U
Carbon tetrachloride	µg/L	5	5	45	0.50 U	0.50 U	0.50 U
Chlorobenzene	µg/L	100	100	25	0.50 U	0.50 U	0.50 U
Chloroethane	µg/L	430	1700	1100	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	µg/L	80	80	350	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	µg/L	260	1100	ID	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	0.2	0.2	-	R	R	R
Dibromochloromethane	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	µg/L	0.05	0.05	5.7	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	µg/L	600	600	13	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	µg/L	6.6	19	28	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	µg/L	75	75	17	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	µg/L	1700	4800	ID	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	µg/L	880	2500	740	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	µg/L	5	5	360	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	µg/L	7	7	130	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	70	70	620	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	µg/L	100	100	1500	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	µg/L	5	5	230	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	µg/L	-	-	-	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	µg/L	-	-	-	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	74	74	18	0.50 U	0.50 U	0.50 U
2-Hexanone	µg/L	1000	2900	ID	R	R	R
Isopropyl benzene	µg/L	800	2300	28	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	µg/L	40	40	7100	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	1800	5200	ID	R	R	R
Methylene chloride	µg/L	5	5	1500	2.0 U	2.0 U	2.0 U
Styrene	µg/L	100	100	80	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	µg/L	8.5	35	78	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	5	5	60	0.50 U	0.50 U	0.50 U
Toluene	µg/L	790	790	270	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	70	70	99	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	µg/L	200	200	89	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	µg/L	5	5	330	0.50 U	0.50 U	0.50 U
Trichloroethene	µg/L	5	5	200	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	µg/L	2600	7300	-	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	2	2	13	0.50 U	0.50 U	0.50 U
<i>o</i> -Xylene	µg/L	280	280	41	0.50 U	0.50 U	0.50 U

TABLE 2

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**SUMMARY OF OCTOBER 2011 GROUNDWATER ANALYTICAL RESULTS**  
**12th STREET LANDFILL**  
**OTSEGO TOWNSHIP, MICHIGAN**

**Sample Location:**  
**Sample Identification:**  
**Sample Date:**  
**Sample Type:**

<b>MW-101S</b> WG-56393-102511-JV-019 10/25/2011	<b>MW-101D</b> WG-56393-102511-JV-018 10/25/2011	<b>MW-102S</b> WG-56393-102511-JV-020 10/25/2011	<b>MW-102S</b> WG-56393-102511-JV-021 10/25/2011
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	<b>Units</b>	<b>Groundwater Cleanup Criteria<sup>(1)</sup></b>			<b>Duplicate</b>		
		<b>a</b>	<b>b</b>	<b>c</b>	<b>0.50 U</b>	<b>0.50 U</b>	<b>0.50 U</b>
<b>m&amp;p-Xylenes</b>							
PCBs	µg/L						
Aroclor-1016 (PCB-1016)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	-	-	-	0.040 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	0.5	0.5	0.2	ND	ND	ND
<b>Metals</b>							
Magnesium	µg/L	400000	1100000	-	24200	23300	22800
Mercury	µg/L	2	2	0.0013	0.001 U	0.00113 U	0.0012 U
Sodium	µg/L	120000	350000	-	23800	23400	19200
<b>General Chemistry</b>							
Cyanide (total)	µg/L	200	200	5.2	10 U	10 U	5 J
							6 J <sup>c</sup>
<b>Field Parameters</b>							
Conductivity, field	mS/cm	-	-	-	.696	0.670	0.670
Dissolved oxygen (DO), field	mg/L	-	-	-	3.58	6.15	0.16
Oxidation reduction potential (ORP), field	millivolts	-	-	-	-29.7	-32.4	-45.0
pH, field	s.u.	6.5 - 8.5	6.5 - 8.5	-	7.01	7.36	7.16
Temperature, field	Deg C	-	-	-	16.19	13.25	18.11
Turbidity, field	NTU	-	-	-	--	21.1	31.9

**Notes:**

Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria<sup>(1)</sup>.

<sup>(1)</sup> Cleanup criteria identified by MDEQ RRD Op Memo No. 1, updated 3/25/2011, pursuant to 1994 PA 451 as amended.

a - Residential drinking water criteria.

b - Non-residential drinking water criteria.

c - Groundwater surface water interface.

U - Not present at or above the associated value.

J - Laboratory qualifiers - estimated concentration.

TABLE 2

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**SUMMARY OF OCTOBER 2011 GROUNDWATER ANALYTICAL RESULTS**  
**12th STREET LANDFILL**  
**OTSEGO TOWNSHIP, MICHIGAN**

**Sample Location:**  
**Sample Identification:**  
**Sample Date:**  
**Sample Type:**

<b>MW-102D</b> WG-56393-102511-JV-022 10/25/2011	<b>MW-103D</b> WG-56393-102611-JV-023 10/26/2011	<b>MW-104S</b> WG-56393-102611-JV-025 10/26/2011	<b>MW-104D</b> WG-56393-102611-JV-024 10/26/2011
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<b>Volatile Organic Compounds</b>	<b>Units</b>	<b>Groundwater Cleanup Criteria (n)</b>			<b>R</b>	<b>R</b>	<b>R</b>	<b>R</b>
		<b>a</b>	<b>b</b>	<b>c</b>				
Acetone	µg/L	730	2100	1700	R	R	R	R
Benzene	µg/L	5	5	200	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	µg/L	10	29	35	0.50 UJ	0.50 U	0.50 U	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	13000	38000	2200	R	R	R	R
Carbon disulfide	µg/L	800	2300	ID	0.50 U	0.50 U	0.50 U	0.50 U
Carbon tetrachloride	µg/L	5	5	45	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	µg/L	100	100	25	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	µg/L	430	1700	1100	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	µg/L	80	80	350	0.50 U	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	µg/L	260	1100	ID	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	0.2	0.2	-	R	2.0 U	2.0 U	2.0 U
Dibromochloromethane	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	µg/L	0.05	0.05	5.7	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	µg/L	600	600	13	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	µg/L	6.6	19	28	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	µg/L	75	75	17	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	µg/L	1700	4800	ID	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	µg/L	880	2500	740	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	µg/L	5	5	360	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	µg/L	7	7	130	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	70	70	620	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	µg/L	100	100	1500	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	µg/L	5	5	230	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	µg/L	-	-	-	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	µg/L	-	-	-	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	74	74	18	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	µg/L	1000	2900	ID	R	R	R	R
Isopropyl benzene	µg/L	800	2300	28	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	µg/L	40	40	7100	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	1800	5200	ID	20 U	20 U	20 U	20 U
Methylene chloride	µg/L	5	5	1500	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	µg/L	100	100	80	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	µg/L	8.5	35	78	0.50 U	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	5	5	60	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	µg/L	790	790	270	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	70	70	99	2.0 U	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	µg/L	200	200	89	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	µg/L	5	5	330	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	µg/L	5	5	200	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	µg/L	2600	7300	-	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	2	2	13	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	µg/L	280	280	41	0.50 U	0.50 U	0.50 U	0.50 U

TABLE 2

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**SUMMARY OF OCTOBER 2011 GROUNDWATER ANALYTICAL RESULTS**  
**12th STREET LANDFILL**  
**OTSEGO TOWNSHIP, MICHIGAN**

**Sample Location:**  
**Sample Identification:**  
**Sample Date:**  
**Sample Type:**

				<b>MW-102D</b> WG-56393-102511-JV-022 10/25/2011	<b>MW-103D</b> WG-56393-102611-JV-023 10/26/2011	<b>MW-104S</b> WG-56393-102611-JV-025 10/26/2011	<b>MW-104D</b> WG-56393-102611-JV-024 10/26/2011
<b><u>Groundwater Cleanup Criteria<sup>(1)</sup></u></b>							
<b>m&amp;p-Xylenes</b>	<b>Units</b>	<b>a</b>	<b>b</b>	<b>c</b>	<b>0.50 U</b>	<b>0.50 U</b>	<b>0.50 U</b>
	µg/L						
PCBs							
Aroclor-1016 (PCB-1016)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	-	-	-	0.040 U	0.039 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	0.5	0.5	0.2	ND	ND	ND
<b>Metals</b>							
Magnesium	µg/L	400000	1100000	-	22700	20500	21700
Mercury	µg/L	2	2	0.0013	0.001 U	0.001 U	0.001 U
Sodium	µg/L	120000	350000	-	19600	18400	20200
<b>General Chemistry</b>							
Cyanide (total)	µg/L	200	200	5.2	<b>9 J<sup>c</sup></b>	<b>9 J<sup>c</sup></b>	<b>10 U</b>
<b>Field Parameters</b>							
Conductivity, field	mS/cm	-	-	-	0.607	0.549	0.610
Dissolved oxygen (DO), field	mg/L	-	-	-	1.88	0.25	1.27
Oxidation reduction potential (ORP), field	millivolts	-	-	-	-34.4	27.2	-32.9
pH, field	s.u.	6.5 - 8.5	6.5 - 8.5	-	7.30	6.98	7.25
Temperature, field	Deg C	-	-	-	15.84	11.65	12.81
Turbidity, field	NTU	-	-	-	3.02	9.82	1.29

**Notes:**

Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria<sup>(1)</sup>.

<sup>(1)</sup> Cleanup criteria identified by MDEQ RRD Op Memo No. 1, updated 3/25/2011, pursuant to 1994 PA 451 as amended.

a - Residential drinking water criteria.

b - Non-residential drinking water criteria.

c - Groundwater surface water interface.

U - Not present at or above the associated value.

J - Laboratory qualifiers - estimated concentration.

TABLE 2

**SUMMARY OF OCTOBER 2011 GROUNDWATER ANALYTICAL RESULTS**  
**12th STREET LANDFILL**  
**OTSEGO TOWNSHIP, MICHIGAN**

**Sample Location:**  
**Sample Identification:**  
**Sample Date:**  
**Sample Type:**

	Units	<u>Groundwater Cleanup Criteria</u> <sup>(a)</sup>			MW-105S	MW-105D	MW-106S	MW-106D
		a	b	c	WG-56393-102611-JV-027 10/26/2011	WG-56393-102611-JV-026 10/26/2011	WG-56393-102611-JV-029 10/26/2011	WG-56393-102611-JV-028 10/26/2011
<b>Volatile Organic Compounds</b>								
Acetone	µg/L	730	2100	1700	R	R	R	R
Benzene	µg/L	5	5	200	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	µg/L	10	29	35	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	13000	38000	2200	R	R	R	R
Carbon disulfide	µg/L	800	2300	ID	0.50 U	0.50 U	0.50 U	0.50 U
Carbon tetrachloride	µg/L	5	5	45	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	µg/L	100	100	25	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	µg/L	430	1700	1100	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	µg/L	80	80	350	0.50 U	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	µg/L	260	1100	ID	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	0.2	0.2	-	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	µg/L	0.05	0.05	5.7	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	µg/L	600	600	13	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	µg/L	6.6	19	28	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	µg/L	75	75	17	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	µg/L	1700	4800	ID	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	µg/L	880	2500	740	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	µg/L	5	5	360	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	µg/L	7	7	130	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	70	70	620	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	µg/L	100	100	1500	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	µg/L	5	5	230	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	µg/L	-	-	-	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	µg/L	-	-	-	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	74	74	18	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	µg/L	1000	2900	ID	R	R	R	R
Isopropyl benzene	µg/L	800	2300	28	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	µg/L	40	40	7100	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	1800	5200	ID	20 U	20 U	20 U	20 U
Methylene chloride	µg/L	5	5	1500	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	µg/L	100	100	80	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	µg/L	8.5	35	78	0.50 U	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	5	5	60	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	µg/L	790	790	270	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	70	70	99	2.0 U	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	µg/L	200	200	89	0.12 J	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	µg/L	5	5	330	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	µg/L	5	5	200	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	µg/L	2600	7300	-	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	2	2	13	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	µg/L	280	280	41	0.50 U	0.50 U	0.50 U	0.50 U

TABLE 2

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**SUMMARY OF OCTOBER 2011 GROUNDWATER ANALYTICAL RESULTS**  
**12th STREET LANDFILL**  
**OTSEGO TOWNSHIP, MICHIGAN**

Sample Location:	Units	MW-105S WG-56393-102611-JV-027 10/26/2011	MW-105D WG-56393-102611-JV-026 10/26/2011	MW-106S WG-56393-102611-JV-029 10/26/2011	MW-106D WG-56393-102611-JV-028 10/26/2011
Sample Identification:	µg/L				
Sample Date:					
Sample Type:					
	<i>Groundwater Cleanup Criteria<sup>(1)</sup></i>	a	b	c	
m&p-Xylenes	µg/L			0.50 U	0.50 U
PCBs	µg/L				0.50 U
Aroclor-1016 (PCB-1016)	µg/L	-	-	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	-	-	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	-	-	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	-	-	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	-	-	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	-	-	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	-	-	0.020 U	0.020 U
Total PCBs	µg/L	0.5	0.5	0.2	ND
Metals					
Magnesium	µg/L	400000	1100000	-	23200
Mercury	µg/L	2	2	0.0013	0.001 U
Sodium	µg/L	120000	350000	-	20500
General Chemistry					
Cyanide (total)	µg/L	200	200	5.2	10 U
Field Parameters					
Conductivity, field	mS/cm	-	-	-	0.629
Dissolved oxygen (DO), field	mg/L	-	-	-	1.41
Oxidation reduction potential (ORP), field	millivolts	-	-	-65.1	51.7
pH, field	s.u.	6.5 - 8.5	6.5 - 8.5	-	7.10
Temperature, field	Deg C	-	-	-	13.25
Turbidity, field	NTU	-	-	-	3.12

## Notes:

Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria<sup>(1)</sup>.

<sup>(1)</sup> Cleanup criteria identified by MDEQ RRD Op Memo No. 1, updated 3/25/2011, pursuant to 1994 PA 451 as amended.

a - Residential drinking water criteria.

b - Non-residential drinking water criteria.

c - Groundwater surface water interface.

U - Not present at or above the associated value.

J - Laboratory qualifiers - estimated concentration.

TABLE 2

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**SUMMARY OF OCTOBER 2011 GROUNDWATER ANALYTICAL RESULTS**  
**12th STREET LANDFILL**  
**OTSEGO TOWNSHIP, MICHIGAN**

**Sample Location:**  
**Sample Identification:**  
**Sample Date:**  
**Sample Type:**

<b>MW-107S</b> WG-56393-102711-JV-030 10/27/2011	<b>MW-108S</b> WG-56393-102711-JV-032 10/27/2011	<b>MW-108D</b> WG-56393-102711-JV-031 10/27/2011	<b>MW-109D</b> WG-56393-102711-JV-033 10/27/2011
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<b>Volatile Organic Compounds</b>	<b>Units</b>	<b>Groundwater Cleanup Criteria (n)</b>			<b>R</b>	<b>R</b>	<b>R</b>	<b>20 U</b>
		<b>a</b>	<b>b</b>	<b>c</b>				
Acetone	µg/L	730	2100	1700	R	R	R	20 U
Benzene	µg/L	5	5	200	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	µg/L	10	29	35	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	13000	38000	2200	R	R	R	20 U
Carbon disulfide	µg/L	800	2300	ID	0.50 U	0.50 U	0.50 U	0.50 U
Carbon tetrachloride	µg/L	5	5	45	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	µg/L	100	100	25	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	µg/L	430	1700	1100	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	µg/L	80	80	350	0.50 U	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	µg/L	260	1100	ID	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	0.2	0.2	-	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane	µg/L	80	80	ID	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	µg/L	0.05	0.05	5.7	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	µg/L	600	600	13	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	µg/L	6.6	19	28	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	µg/L	75	75	17	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	µg/L	1700	4800	ID	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	µg/L	880	2500	740	0.50 U	0.50 U	0.14 J	0.50 U
1,2-Dichloroethane	µg/L	5	5	360	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	µg/L	7	7	130	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	70	70	620	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	µg/L	100	100	1500	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	µg/L	5	5	230	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	µg/L	-	-	-	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	µg/L	-	-	-	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	74	74	18	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	µg/L	1000	2900	ID	R	R	R	20 U
Isopropyl benzene	µg/L	800	2300	28	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	µg/L	40	40	7100	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	1800	5200	ID	20 U	20 U	20 U	20 U
Methylene chloride	µg/L	5	5	1500	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	µg/L	100	100	80	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	µg/L	8.5	35	78	0.50 U	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	5	5	60	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	µg/L	790	790	270	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	70	70	99	2.0 U	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	µg/L	200	200	89	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	µg/L	5	5	330	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorethene	µg/L	5	5	200	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	µg/L	2600	7300	-	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	2	2	13	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	µg/L	280	280	41	0.50 U	0.50 U	0.50 U	0.50 U

TABLE 2

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**SUMMARY OF OCTOBER 2011 GROUNDWATER ANALYTICAL RESULTS**  
**12th STREET LANDFILL**  
**OTSEGO TOWNSHIP, MICHIGAN**

**Sample Location:**  
**Sample Identification:**  
**Sample Date:**  
**Sample Type:**

				<b>MW-107S</b> WG-56393-102711-JV-030 10/27/2011	<b>MW-108S</b> WG-56393-102711-JV-032 10/27/2011	<b>MW-108D</b> WG-56393-102711-JV-031 10/27/2011	<b>MW-109D</b> WG-56393-102711-JV-033 10/27/2011
<b>m&amp;p-Xylenes</b>							
PCBs	Units µg/L	a	b	c	0.50 U	0.50 U	0.50 U
Aroclor-1016 (PCB-1016)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	-	-	-	0.040 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	-	-	-	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	0.5	0.5	0.2	ND	ND	ND
<b>Metals</b>							
Magnesium	µg/L	400000	1100000	-	27300	23900	26900
Mercury	µg/L	2	2	0.0013	0.001 U	0.00112 U	0.001 U
Sodium	µg/L	120000	350000	-	26700	19500	46100
<b>General Chemistry</b>							
Cyanide (total)	µg/L	200	200	5.2	10 U	10 U	10 U
<b>Field Parameters</b>							
Conductivity, field	mS/cm	-	-	-	0.784	0.736	0.817
Dissolved oxygen (DO), field	mg/L	-	-	-	0.27	1.33	0.17
Oxidation reduction potential (ORP), field	millivolts	-	-	-	-21.2	-63.2	-81.1
pH, field	s.u.	6.5 - 8.5	6.5 - 8.5	-	6.83	7.00	7.28
Temperature, field	Deg C	-	-	-	12.23	12.59	11.82
Turbidity, field	NTU	-	-	-	5.21	8.74	3.82

**Notes:**

Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria<sup>(1)</sup>.

<sup>(1)</sup> Cleanup criteria identified by MDEQ RRD Op Memo No. 1, updated 3/25/2011, pursuant to 1994 PA 451 as amended.

a - Residential drinking water criteria.

b - Non-residential drinking water criteria.

c - Groundwater surface water interface.

U - Not present at or above the associated value.

J - Laboratory qualifiers - estimated concentration.